Tesla Electronics Inc.

G-TECH/Pro SS/RR Fanatic Manual

Detailed user manual – preliminary version

August 2011

PRELIMINARY

Warning: Always obey all local and federal traffic laws when using this device.

Warning: Adverse weather conditions can severely impair given vehicles controllability, especially at high speed. When using this device, drive cautiously and within the limits of your vehicle under the conditions.

Warning: Do not take your eyes of the road. This device is capable of recording any measurement and replaying it later after the car has been stopped in a safe environment. This device is designed as a recording instrument for a given vehicle. Use it for that purpose only.

TESLA Electronics Inc. or any of its subsidiaries shall not be held liable in any way for any accidental or consequential damages to the vehicle, driver, passengers, and/or other involved parties or property occurring while using G-TEC device.

TESLA Electronics Inc. reserves the right to make changes to this manual or other product specifications at any time and without any further notice.

The content o this manual is for informational use only and is not intended as a commitment of any kind.

Please drive safely.

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PRELIMINARY

1 Welcome

1.1 Thank you

I would like to take this opportunity to thank you for being who you are. You, and guys like you, are keeping car enthusiasm alive and well.

This new G-TECH/Pro Performance Meter is based on High-Speed 10Hz GPS technology and it's better than ever. It's everything I always wanted it to be, so please enjoy it.

Jovo Majstorovic
President & CEO, TESLA Electronics Inc.

1.2 About your G-TECH

Your G-TECH is built for severe vibration environment, that's why all of the components are "floating" inside rubber material. There is no stress-points and hard mounts anywhere on the device. G-TECH has a built-in High-Frequency GPS antenna (square bulge in the back) which needs to be exposed to the sky. When the unit is turned on you will see the amount of satellites currently in the view (12 maximum) in the upper right corner of the display. The more satellites G-TECH "sees" the higher the accuracy will be. When you turn on the G-TECH it will take a few minutes to lock onto the satellites. Look for a small plus sign between the satellite icon and the number of satellites. This indicates that SBAS (Satellite Based Augmentation System) is locked in, this will improve accuracy. For best performance, keep the G-TECH right on top of the dash in the bottom of the windshield. Small icon on top of the screen indicates if the MicroSD card was inserted properly (RR model).

There are two models, SS (Super Sport) and RR (Road Racer). To upgrade from SS to RR is as simple as inserting a RR expansion board in the back of the unit. Available at gtechpro.com

SS is intended for all of the standard straight-line performance measurements including, Horsepower, Torque, 0-60mph, 60ft times, 1/8 mile, 1/4 mile, braking distance and more. It has the capability to replay runs and can be used in all vehicles including cars, motorcycles, boats, tanks etc.

RR model has all of the functions of the SS plus it has the ability to record lap times on the racetrack. RR is also capable of displaying lap-segment times as you are driving. This feature will help you improve as a driver and help shave-off seconds from your lap times.

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2 Basics

2.1 Front Side

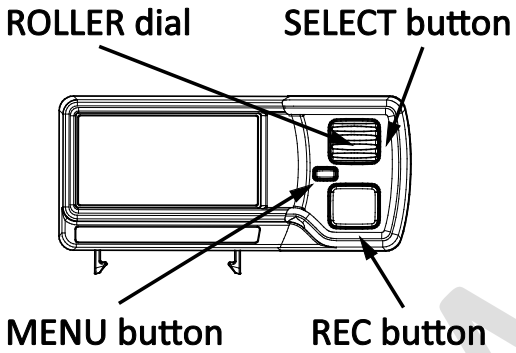

Figure 1: G-TECH front side

-

MENU button – used to get you in and out of main menu and out of submenus

-

ROLLER dial – is the most important in navigating though the user interface. Please note that besides being able to rotate up and down, it can also be pushed-in to select a given menu item.

-

SELECT button – is the part of the ROLLER dial. You can push-in the ROLLER dial and this action will be referred to as SELECT button throughout this manual.

-

REC button – this is the record/replay button and it its used to let G-TECH know that you want to start a SS run or a RR session recording. It's also used to input Start/Finish line and segment gates in RR mode. Throughout this manual, this button will be referred to simply as REC button.

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2.2 Back Side

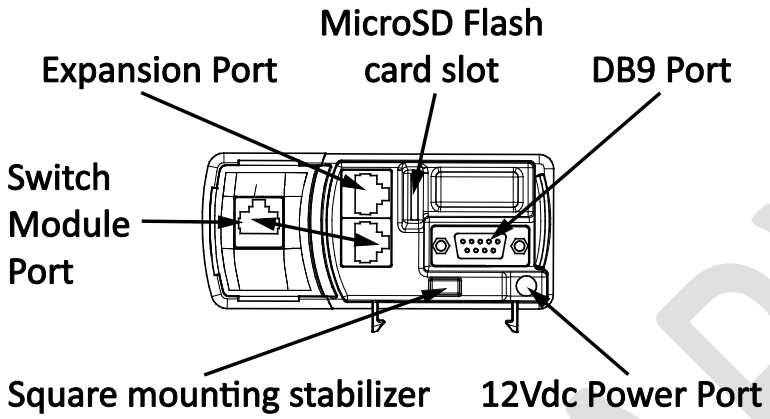

Figure 2: G-TECH back side

- **12Vdc Power Port** – plug in the supplied DC power cable into this connector
- **Expansion Port** – reserved for future use
- **Switch Module Port** – connect Switch Module to this port using supplied Ethernet cable
- **DB9 Port** – no user functions are available trough this port, used in G-TECH production and maintenance only
- **MicroSD FLASH Card Slot** – It uses "push in & push out" action just like a ball-point pen. Pushing it with a paper-clip works well
- **Square mounting stabilizer** – Insert this stabilizer into the square hole in the mounting clip and snap it.

2.3 Accessories

- **12V cigarette lighter DC Power Cable** – supplies power from vehicle's accessory (cigarette lighter) plug.

  The DC Power Plug has a fuse at the end that plugs into your vehicle. If the cable does not seem to provide power, the fuse may be blown and need replacing.

  To replace the fuse, unscrew the tip and replace the fuse with a standard 1A (one ampere) fuse. Fuses can normally be purchased at any automotive parts store.
- **Mounting System** – used to hold your G-TECH steady in you vehicle.
  For additional details, please refer to "Mounting System" on page 11.

2.4 Icons and Navigation

The G-TECH's functionality is accessible trough its user-friendly icon interface.

Pressing the PUSH **MENU** button on the Main Screen brings up the main menu, as shown below:

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Figure 3: The G-TECH's Main Menu

The name of the menu appears in the Menu Title Bar at the top of the display (“Main Menu” in this example).

The main menu has 4 icons. The first icon is in “reverse video” because it is the active (selected) icon. Use the **ROLL** dial to move amongst the different icons.
For example, moving the **ROLL** dial down by “one click” in Figure 3 would move the icon selection to the ***Setup*** icon, as shown below:

Figure 4: Main Menu: "Setup" icon selected

The ***Setup*** Icon Hint in Figure 4 indicates that the selected icon represents setup items.

Use the **SELECT** button to make a selection. For example, to customize the G-TECH you would move to ***Setup*** icon and then press **SELECT** button.

Selecting ***Exit*** icon on any menu brings you up one level. If you are on the Main Menu when you select ***Exit***, you will be returned to the Main Screen.

Figure 5: Main Menu: "Exit" icon selected

Moving one level up on any menu can also be accomplished by pressing **MENU** button. If you are on the Main Menu when you press **MENU** button, you will be returned to the Main Screen. Pressing MENU button again while on Main Screen will bring you back to Main Menu.

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3 Quick Setup

3.1 Connecting

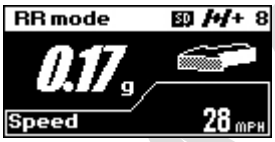
There are only two cables to connect on the G-TECH unit. The Switch Module is connected to Switch Module Port by supplied short Ethernet cable. If you want to mount the Switch Module away from G-TECH unit you can use longer straight-trough Ethernet cable to do that. Power supply is connected trough 12VDC Power Port.

For location of Switch Module Port and 12VDC Power Port, please see the image in section 2.2 on page 7.

3.2 Adjusting Local Time

G-TECH date and time are based on Coordinated Universal Time (UTC) which is extracted from GPS signal. This time code is closely related to Greenwich Mean Time (GMT) and it has time zones defined the same way as GMT. To obtain correct date and time you need to adjust difference between UTC and your local time.

To access ***Adjust local time*** menu, follow the steps below:

		Press **MENU** button to enter ***Main Menu***	
		Select ***Setup***	
		Select ***G-Tech Setup***	
		Select ***Adjust local time***	

Note: *This setup requires that G-TECH has a valid GPS signal in order to extract UTC date and time. If that is not the case, you will see a screen as shown below:*

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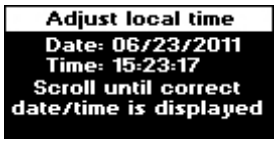
Figure 6: Adjust local time - no valid GPS signal

Note: *You need to be in open space for G-TECH to acquire valid GPS signal. If you are in garage, under the large bridge or in a tunnel, please drive your car out into open.*

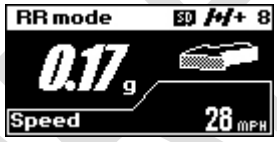
Once G-TECH has a valid GPS signal you will be presented with this screen, where you can use **ROLL** button to change displayed time until it mach your local time.

		Roll up or down to adjust time displayed on the screen		Confirm selection Cancel changes

You can adjust only hour portion of the time which corresponds to your local time zone. UTC time is extremely accurate and it's minutes and seconds portions are guaranteed to be correct, therefore they can't be changed.

3.3 Car Weight

Note: *Vehicle weight must be set properly in order to obtain accurate HP measurements. For help determining vehicle weight, please see page 59 for details.*

		Press **MENU** button to enter ***Main Menu***		
		Select ***Setup***		
		Select ***Car setup***		

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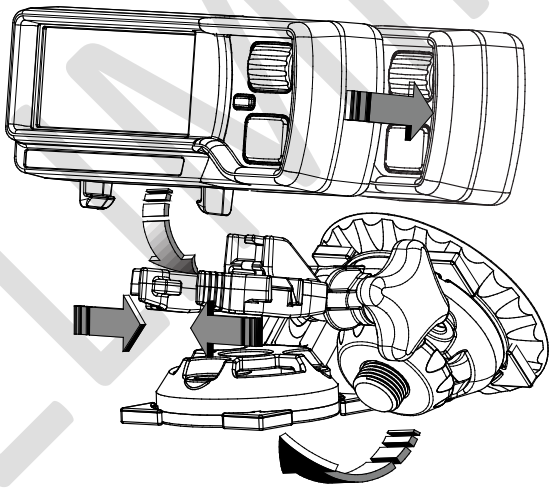
		Select ***Enter Car weight***		
		Roll to adjust car weight		Confirm selection Cancel changes

3.4 Mounting System

To mount the G-TECH in the clip, insert the square mounting stabilizer at the back of the G-TECH into the square hole in the clip and snap it. To remove it, squeeze the handles and pull it out. See illustration below for details.



Switch module can be detached from G-TECH body by pushing it backward. This way you can mount it somewhere closer to you. You will find this very useful especially when strapped in a 5-point racing harness. It uses a regular Ethernet straight-trough (network) cable which can be purchased in any electronics store.

G-TECH can be mounted on the windshield with the suction cup or any other surface, including the dashboard by using the three mounting screw holes or a 2” square piece of Velcro.

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4 Everyday Driving

4.1 Main Screen Overview

After power-on, the G-TECH starts GPS communication (Figure 7) followed by searching for satellites (Figure 8). Until it acquires valid GPS signal, G-TECH will keep this message on.

Figure 7: Starting GPS: establishing GPS communication

Figure 8: Starting GPS: searching for satellites...

Note: *You need to be in open space for G-TECH to acquire valid GPS signal. If you are in garage, under the large bridge or in a tunnel, please drive your car out into open.*

After acquiring valid GPS signal, G-TECH will hide "STARTING GPS" message and you will be presented with Main Screen

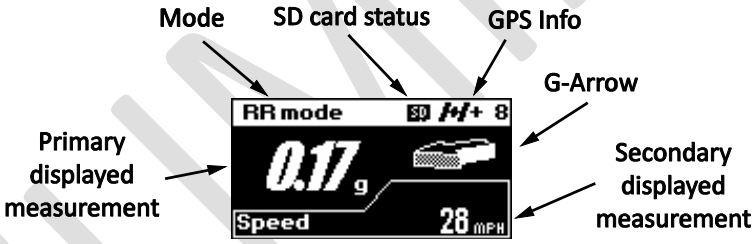

Figure 9: G-TECH's Main Screen

The Main Screen in Figure 9 has six main indicators:

- **Mode** – shows current mode of operation
- **Primary displayed measurement** – shows selected measurement in big numbers
- **Secondary displayed measurement** – shows selected measurement in smaller numbers
- **G-Arrow** – direction of G-Force
- **GPS Info** – basic information of current GPS status
- **SD card status** – indicates whether SD card file system is available

4.2 Mode

G-TECH Fanatic series devices come in two versions, SS and RR. The G-TECH SS Fanatic has one mode of operation, the "SS mode" which will always be indicated on the Main Screen. If you purchased G-TECH RR Fanatic, or upgraded your G-

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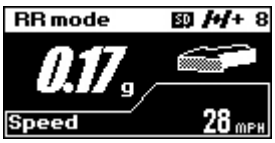
TECH SS Fanatic with SS to RR Upgrade Kit, you will be able to choose operating mode. In this case G-TECH will indicate current mode by showing “SS mode” or “RR mode”.

For additional details about SS and RR modes, please see page 15 or page 18 respectively.

4.2.1 Mode Change

		Press **MENU** button to enter ***Main Menu***		
		Select ***Switch SS/RR mode***		
		Roll up or down to select mode		
		Roll up or down to select mode		Confirm selection Cancel changes

4.3 Primary displayed measurement

By default, primary displayed measurement indicates amount of G-force. In combination with G-Arrow it creates a Real-time G meter. Primary displayed measurement can be configured to show any of these 3 parameters: G-force, speed or real time horsepower.

Please see page 46 for details on configuring Main Screen.

4.4 Secondary displayed measurement

By default, secondary displayed measurement indicates current speed. It can be configured to show any of these 3 parameters: Speed, G-force or real time horsepower.

Please see page 46 for details on configuring Main Screen.

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4.5 GPS Info

GPS info indicator consists of satellite icon followed by SBAS indicator and number of satellites being tracked.

G-TECH's GPS receiver is SBAS enabled, meaning that it can provide improved performance trough integration of external information when available. If SBAS is available, satellite icon is followed by "+" sign, otherwise by "-" sign.

GPS Info	Condition
+8	Eight satellites being tracked, SBAS available
−9	Nine satellites being tracked, SBAS unavailable

Please see page 58 for more information on SBAS.

4.6 G-Arrow

The Real-time G Meter is a combination of the G-Value and the G-Arrow. It indicates both the amount and direction of G-force, whether your vehicle is braking, cornering, or blasting down the dragstrip.

The display is continuously updated in response to your driving, and tells you all you need to know about your vehicle's handling and acceleration capabilities.

The G-value indicates the amount of G-force to within a one hundredth of a G. G-Arrow indicates the direction of G-force.

Figure 10 illustrates how to read the Real-time G Meter.

G-Arrow	G-Value	Condition
	.85	Accelerating Fwd 0.85 Gs
	.75	Right Turn 0.75 Gs
	.34	Left Turn 0.34 Gs
	1.55	Braking 1.55 Gs
	.28	Left Turn & Accelerating 0.28 Gs
	.56	Right Turn while Braking 0.56 Gs
	.00	Minimal G-force

Figure 10: Real-time G Meter examples

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4.7 SD card status

This indicator is available only on G-TECH RR Fanatic which uses SD file system for data storage.
Display of SD card icon indicates that card is present and file system is operational.

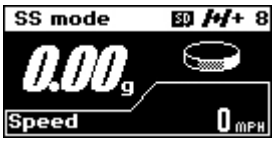
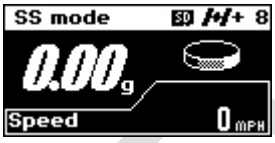
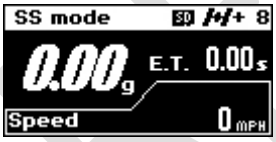
5 Performing SS Runs

Note: *G-TECH must be in SS mode to perform SS Run. For information on how to change current mode, please see page 13.*

There are two types of measurements possible in SS mode, the SS Acceleration Run and HP-TQ Measurement. They require different driving techniques so please be sure to read and understand following instructions.

5.1 SS Acceleration Run

This section describes how to measure accelerating and braking performance. With G-TECH Fanatic series this type of measurement can be made either from stop or while car is already running.

		Make sure G-TECH is mounted properly, powered on, in SS mode, GPS has a valid signal, and Main Screen is displayed
		Press **REC** button to activate recording
		Accelerate you vehicle briskly and G-TECH will automatically start recording. Note that E.T. clock will start running.
		Keep driving…

Note: *The G-TECH requires some "oomph" to automatically start recording. If G-TECH doesn't start timing, launch your car with more force. G-TECH will reduce the amount of force required if you're not starting from stop.*

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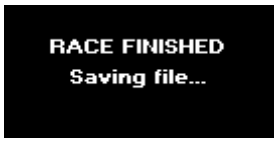
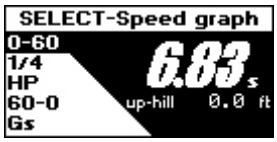
To finish the run:

- if you want to measure braking distance, brake strongly all the way to a complete stop, and wait for the E.T. clock to stop
- if you do not care about braking distance, simply let off throttle and coast for about 1 second, until E.T. clock stops
- press **REC** or **MENU** button to cancel the race

		The run will be saved automatically. While the run is being saved, the display will show "RACE FINISHED" screen as shown here.
		After saving the run, G-TECH will open it for review as show bellow. For information on how to view and analyze your runs, please see page 31.

Note: *If you don't have enough free storage in internal memory, you will not be able to start the SS Run.*

Figure 11: Internal memory is full

Note: *If you do not travel at least 60 ft, or you loose GPS signal while recording, the run will be discarded.*

Figure 12: Race too short

Figure 13: GPS lost

5.2 HP-TQ Measurement

This type of measurement requires different driving technique. For best results make sure you follow the instructions from G-TECH.

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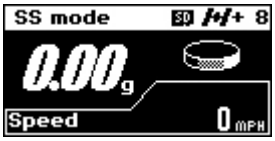
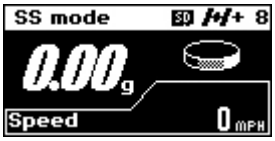
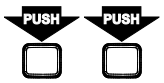
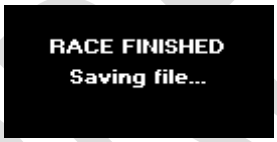
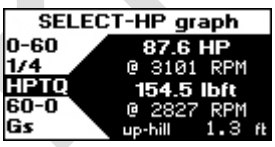
		Make sure G-TECH is mounted properly, powered on, in SS mode, GPS has a valid signal, and Main Screen is displayed
		Double-click **REC** button to activate recording
		Start your vehicle and keep driving according to instructions. Drive in 2nd gear and keep your engine at 2000 RPM.
		When you have reached 2000 RPM, press **REC** button to start recording.
		Step on the accelerator <u>all the way down</u>. Keep driving like that until you reach redline with engine RPMs.
		If you reached redline, let the throttle off and coast for about 1 second, until E.T. clock stops.
		The run will be saved automatically. While the run is being saved, the display will show “RACE FINISHED” screen
		After saving the run, G-TECH will open it for review. For information on how to view and analyze your runs, please see page 31.

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6 Recording RR Sessions

Note: *G-TECH must be in RR mode to record RR Session. For information on how to change current mode, please see page 13.*

In RR mode you can record your racing session on circular or hill-climb tracks. During the session G-TECH records your vehicle's position, speed, acceleration and lap times all in real time as you go.

6.1 RR Session Concepts

6.1.1 Gates

When thinking about gates, first thing you should think of is a START/FINISH line on a circular track. This line is defined by two points, one on the leftmost side of the track and other on the rightmost side. During the race you are crossing the START/FINISH line only in one direction. This means that START/FINISH line is orientated is in driving direction.

G-TECH specifies gates the same way. They have a direction and they are defined by two points on a map. Only difference is that defining points usually lay outside the track, the gate is normally wider than track.

There are also two types of gates. The START/STOP gates are special because they define the start and end of the track. On circular tracks, this is the same line. On hill-climb track these are two different gates.

Other type of gate is a segment gate, it is used to mark positions on track and divide track into segments. This way you can measure segment times, cornering times, etc.

The START/STOP gates are defined during map recording and they can not be changed or moved. The segment gates can be defined during map recording or you can add/remove them later when reviewing the session.

On how to change segment gates after the session, please see page 43.

6.1.2 Map

G-TECH maps are defined by START/STOP gate, optional segment gates and GPS location points representing the race track shape. Each map has a name and default viewing orientation.

All RR Sessions are driven on maps which can be recorded during the race or reused from some previous session.

6.1.3 Map-Vicinity Automatic Recording

While in RR mode, G-TECH is constantly tracking distances to existing maps. When you approach the location of existing map G-TECH will detect that situation and load the map in preparation for RR Session recording. If multiple maps are found in your vicinity you will be asked to select which map you will be driving at.

With Map-Vicinity Automatic Recording you can start RR Session recording without even having to press one button. Just drive your vehicle to the track, go over the START line and that's it!

G-TECH will load the map as you approach the track and start recording when you cross the START line.

PRELIMINARY

On how to enable/disable Map-Vicinity Automatic Recording, please see page 47.

6.1.4 The "Thumb" Screens

During the RR Session, every time you finish a segment, you will get "Thumbs Up" or "Thumbs Down" screen with the amount of time gained or lost in that segment. If you made better time, the entire screen will invert, so you can sense this with peripheral vision, without ever taking the eyes of the track.

Each thumb is filled to a certain level depending on how much time you gained or lost in that particular segment. Completely filled thumb means that you have gained or lost more than 5 seconds.

Figure 14: Thumb up, big loss

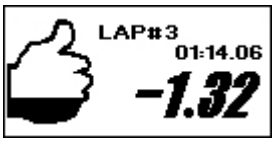


Figure 15: Thumb up, small loss

Figure 16: Thumb down, small gain

Figure 17: Thumb down, big gain

This is like heaving a race-driving instructor with you all times. Best of all, there is no need for waiting to see the information, it's immediate, while it's still fresh in your mind and you know what you just did. It's the best way to implement incremental improvements in your driving and get faster by slowly building up speed and "picking-up" time on the track anywhere you can. This feature will definitely make anyone a better driver.

6.2 RR Session – Circular Track

Depending on whether you're driving on existing map or you need to record a new one (new location), RR Session recording will be somewhat different.

6.2.1 Starting RR Session recoding

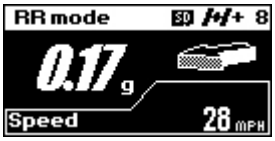
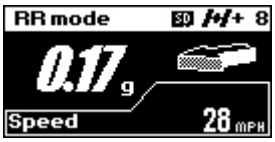
To start RR Session recording make sure you are on the Main Screen and in RR mode.

Depending on whether you are driving on new location and if Map-Vicinity automatic recording is enabled there are three scenarios:

- driving on new location, no previous map exists
- driving on location with prerecorded map, Map-Vicinity automatic recording is disabled
- driving on location with prerecorded map, Map-Vicinity automatic recording is enabled

PRELIMINARY

6.2.2 Driving on new location

		Make sure G-TECH is mounted properly, powered on, in RR mode, GPS has a valid signal and Main Screen is displayed
		Press **REC** button to initiate RR Session recording
		G-TECH will prepare itself for RR Session which may take few seconds
		When G-TECH finishes preparing for RR Session you will be presented with this info screen
		Now you need to tell G-TECH where the START/FINISH line is. To do that, you need to press **REC** button when your car is on the START/FINISH line. There are two ways to do that: • drive your car to the START/FINISH line, stop it there, press **REC** button and hit the accelerator. • or drive down the track, and without stopping at START/FINISH line, press **REC** button at the exact moment that you pass over the START/FINISH line. This way you will set the first gate on this map, the START/FINISH gate

Note: *When setting the START/FINISH gate, make sure that you approach the START/FINISH line straight forward. Also, do not move your vehicle back and forth around START/FINISH line trying to position your car right on to it. Instead, just drive straight forward to START/FINISH line and stop at it.*

If you approach the START/FINISH line at an angle, the START/FINISH gate that you are setting will also be angled in respect to the track. Moving your car back and forth at the START/FINISH line can cause your START/FINISH gate to be oriented in wrong direction. In that case, G-TECH will not be able to detect when you cross START/FINISH line.

PRELIMINARY

		After setting the START/FINISH gate, G-TECH will switch to map recording and now you need to drive the track. You will see a screen with message as shown here.
		After a few seconds message will clear from screen as shown here

Note: *If you are setting the START/FINISH gate from stop, you will have 5 seconds to accelerate your car and continue driving down the track. If you keep your vehicle on START/FINISH line for more than 5 seconds, RR Session recording will be aborted.*

While driving the track G-TECH will show you the running lap time, current speed and G-force bar-graph.

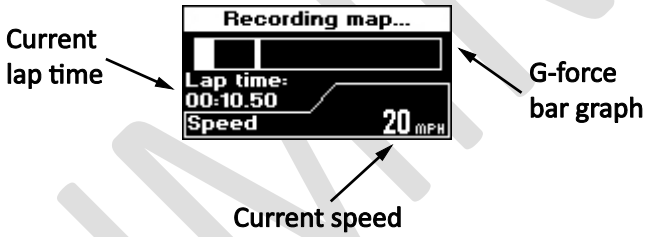


Figure 18: Recording map, screen elements

		During map recording you can place additional gates for dividing the track into segments. To do that, just press **REC** button any time. G-TECH will confirm that new gate was accepted by displaying appropriate message as shown on the next screen

Note: *In order to prevent accidental adding of multiple gates, there is a 5 seconds guard time between two successive gates. This restriction applies for gates added during the map recording. After the race you have an option to set additional gates wherever you like. For details on editing gates, please see page 43.*

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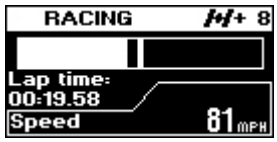
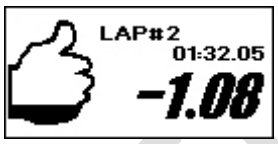
Note: *Your vehicle must be moving at speed grater than 5 mph for gate to be accepted. Adding gates while stopped or moving with less than 5 mph will be ignored.*

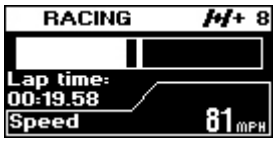
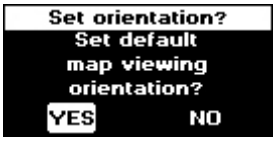
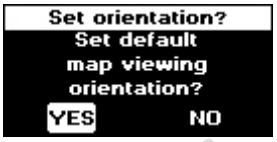
		When you finish the first lap on track (cross the START/FINISH line), G-TECH will switch from "Recording map…" into "RACING" mode. You will also see the message that informs you on 1st lap time as shown here
		After few seconds message will clear, leaving just the RACING screen as shown here.

Note: *If you just want to record map without driving the whole session, you can stop RR Session recording after the 1st lap. In that case skip the following set of instructions and go straight to next set on stopping the RR Session recording. G-TECH will use recorded data to create map for the track you were driving.*

		If you added segment gates during the map recording, crossing over one of these gates will bring the segment time message on screen as shown here
		When you finish the 2nd lap on track, G-TECH will bring up the "Thumb" screen to inform you on time you gained or lost in the lap as shown here
		If you added segment gates during the map recording, starting from 2nd lap, crossing over one of these gates will bring the "Thumb" screen with the amount of time you gained or lost. as shown here

PRELIMINARY

To stop RR Session recording, follow the instructions below:

		To stop RR Session recording and create map from recorded data press **MENU** button anytime after completing the 1st lap. Dialog appears asking you to confirm stopping of session recording		
		Select ***YES***		
		G-TECH starts creating map form recorded data. This operation can take several seconds to complete depending on the size of the map		
		After successfully creating map, you will have an option to set default orientation for a new map as shown here		
		Select ***YES***		

Note: *Selecting NO will complete map recording and setup and jump to file system entry for this RR Session. You will not be presented with further options for map setup, but you will be able to change them later. On how to change map options for existing maps, please see RR Session Review on page 37.*

		Selecting ***YES*** will display the recorded map asking you to select default orientation		
		Use **ROLLER** to rotate the map the way you find it most suitable		When satisfied with your choice press **SELECT** to confirm orientation

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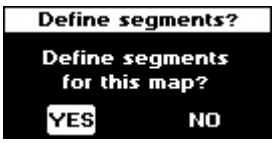
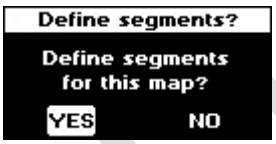
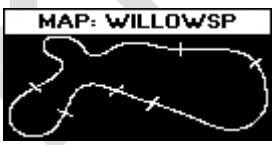
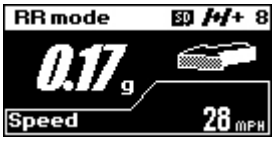
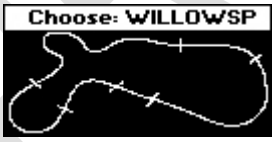
		After setting the default orientation, you will be asked to set a name for the map		
		Use **ROLLER** to select ***YES***		Confirm your selection by pressing **SELECT** button
		Use **ROLLER** to change highlighted character		Pressing **SELECT** will set the highlighted character and move selection on next one
		When satisfied with entry, press **REC** button to save this map under new name		
		After renaming the map, you will be asked to define segments		
		Use **ROLLER** to select ***YES***		Confirm your selection by pressing **SELECT** button
		Use **ROLLER** to move cursor up and down the track		Press **SELECT** to add new gate(s)
		When satisfied with gates setup press **REC** to save your configuration		

Note: *Gates Editing screen has more features, like deleting specific gates, clearing all gates, etc. For additional information on Gates Editing screen, please see page 43.*

PRELIMINARY

		After setting the gates you will be given the option to replay last session as shown here. See page 37 for more details on RR Session review

6.2.3 Driving on prerecorded map with automatic recording enabled

		Make sure G-TECH is mounted properly, powered on, in RR mode, GPS has a valid signal and Main Screen is displayed. Drive you vehicle to a location where you recorded a map(s).		
		When you get into vicinity of map location, G-TECH will detect that and display a screen as shown here.		
		Depending on whether you have one ore more maps in vicinity of your current location, G-TECH will load the map or inform you that multiple maps were detected. In case of single map, it will be automatically loaded within few seconds. In case of multiple maps, you will have an option to choose which map to use		
		If multiple maps were detected, use **ROLLER** to select map you want to drive.		
		Use **ROLLER** to select a map		Press **SELECT** to confirm your selection
		While loading a map, G-TECH will show you this screen		

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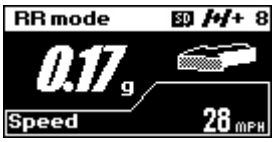
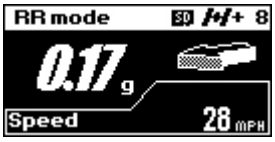
		After loading the map, G-TECH is ready to start recording RR session as soon as you drive over the START line. You will see a screen with scaled map and plus marker indicating your current position

6.2.4 Driving on prerecorded map with automatic recording disabled

		Make sure G-TECH is mounted properly, powered on, in RR mode, GPS has a valid signal and Main Screen is displayed. Drive you vehicle to a location where you recorded a map(s).		
		When you get into vicinity of map location, press **REC** button.		
		You will be given a choice to record new map or drive on existing one, as show here.		
		Use **ROLLER** to select ***YES*** or ***NO***		Selecting ***YES*** will load a map or bring the map selection screen Selecting ***NO*** will start new map recording

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6.3 RR Session – Hill-Climb

Hill-Climb sessions are driven on non-circular tracks. This means that every hill-climb map has a separate START and FINISH gate defined.

6.3.1 Starting RR Session recoding

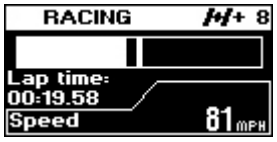
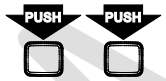
To start RR Session recording make sure you are on the Main Screen and in RR mode.

Depending on whether you are driving on new location and if Map-Vicinity automatic recording is enabled there are three scenarios:

- driving on new location, no previous map exists
- driving on location with prerecorded map, Map-Vicinity automatic recording is enabled
- driving on location with prerecorded map, Map-Vicinity automatic recording is disabled

6.3.2 Driving on new location

Recording hill-climb session on new location is almost the same as recording a circular track session. The only difference is that for hill-climb session you need to define separate START and FINISH gates. To do that, start session recording as you would for circular track. To stop recording, and place the FINISH gate, double-click **REC** button.

		To stop Hill-Climb RR Session recording and create map from recorded data double-click **MENU** button anytime during the session.

See section “Driving on new location” on page 20 for more details. Everything said there applies to Hill-Climb sessions too. The only difference is the way you stop session recording.

6.3.3 Driving on prerecorded map with automatic recording enabled

This scenario is the same as for circular maps. See section “Driving on prerecorded map with automatic recording enabled” on page 25 for more details.

6.3.4 Driving on prerecorded map with automatic recording disabled

This scenario is the same as for circular maps. See section “Driving on prerecorded map with automatic recording disabled” on page 26 for more details.

PRELIMINARY

7 Reviewing Runs

7.1 Opening Saved Run

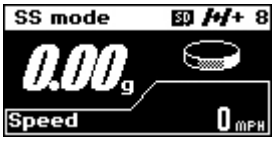
Each G-TECH has an internal FLASH memory for saving up to twelve SS Runs. For additional storage you will need an RR Upgrade kit, which enables the RR mode of operation and provides micro SD card interface and file system. With this upgrade kit you can use micro SD cards for practically unlimited storage of SS Runs and RR Sessions.

7.1.1 From Internal Memory

Internal FLASH memory is used exclusively for saving SS Runs. It has a limited storage space for twelve SS Runs. You can save your runs for later review or delete selected runs to free some space.

Note: *Internal memory is always accessible on SS units. On RR units or upgraded SS units internal memory is accessible only if no valid micro SD card is present.*

To open a saved run from internal memory

		Press **MENU** button to enter ***Main Menu***		
		Use **ROLLER** to select ***Saved runs*** option		Press **SELECT** to confirm

Saved runs screen appears as shown below:

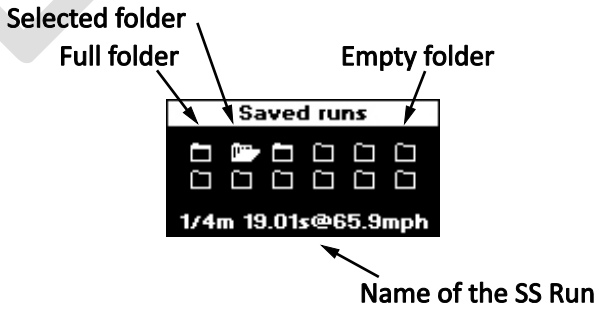


Figure 19: Saved runs, internal memory

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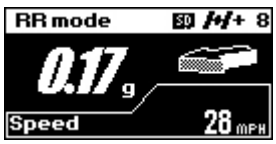
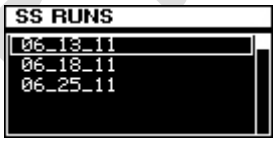
Each run is represented with folder icon which can be empty or full. Selected run is shown as open folder. Name of the selected run, with key result, is displayed at the bottom of the screen, as shown in Figure 19.

		Use **ROLLER** button to select a run		Press **SELECT** to confirm
		Use **ROLLER** to select ***Replay this run***		Press **SELECT** to confirm. This will open the run for review.

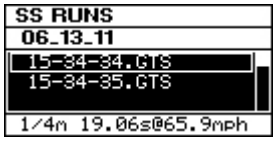
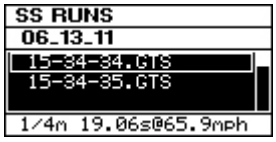
7.1.2 From SD Card File System

SD Card File System is available only on RR units and is organized in familiar way, as folders and files. Both SS Runs and RR Sessions are saved here if you are using a RR unit.

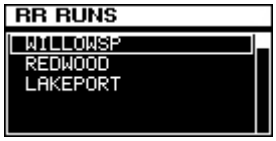
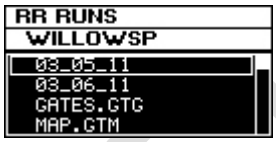
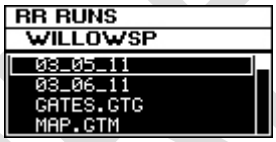
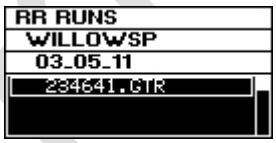
To open a saved SS run,

		Press **MENU** button to enter ***Main Menu***		
		Use **ROLLER** to select ***Saved runs*** option		Press **SELECT** to confirm
		Use **ROLLER** to select type of run you want to open		Press **SELECT** to confirm
		SS runs are arranged in folders for each date. Use **ROLLER** button to select date folder		Press **SELECT** to open the date folder

PRELIMINARY

		Each run within date folder is named with time-stamp when it was recorded. When you select a particular run, you will get the key result for that run displayed on the bottom of the screen as shown here		
		Use **ROLLER** button to select a run		Press **SELECT** to open the run for review

To open a saved RR Session:

		Use **ROLLER** to select ***RR RUNS***		Press **SELECT** to confirm	
		RR Sessions are arranged in map folders which are named by the map they represent. Use **ROLLER** button to select a map folder.		Press **SELECT** to open the map folder	
		Each map folder has two additional files, besides all the date folders. One of them is called MAP.GTM and it's used to rotate the map (see page 44). The other file is called GATES.GTM and it's used to input/edit map segments (see page 43).			
		Use **ROLLER** button to select date folder		Press **SELECT** to open the date folder	
		The date folders contain the RR Session files which are time-stamped when they were recorded. Use **ROLLER** button to select session file.		Press **SELECT** to open the session file	

PRELIMINARY

7.2 SS Run Review

The run review allows you to see all the details of particular run. These details include results like:

- 0-60 MPH time
- ¼ mile E.T. and trap speed
- ¼ mile replay
- Horsepower and torque
- Intermediate mile stones, such as 60 ft time, 330 ft time, 1/8 mile time and speed, 1000 ft time
- Forward G-force measurements

There are two ways to enter the SS Run Review:

- Automatically after you have completed a run
- When you review a saved run (see Opening Saved Run on page 28)

The G-TECH remembers what type of result you most recently looked at (e.g. HP, 0-60 MPH, etc.) and brings you back to the same result when you view a new run.

Each entry in the results menu has two functions. First, when you select an entry, the highlighted result is displayed. Additionally, each entry has an associated graph that can be viewed by **SELECT** button. The title bar at the top of each entry indicates which graph will be shown when you press **SELECT** button.

Use **ROLLER** to view the different results. Use **MENU** button to exit.

Figure 20 below shows the 0-60 menu as an example. In this example 0-60 mph result is 6.83 seconds, with measured altitude difference between start and finish of 1.3 ft.

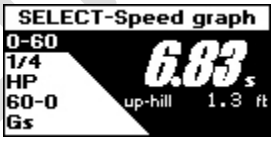
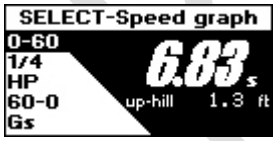
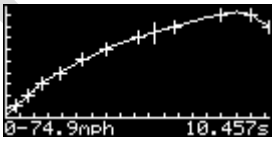
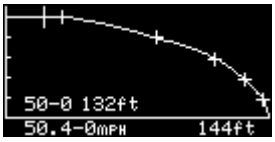
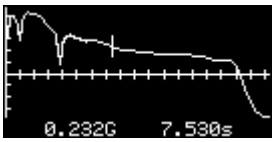
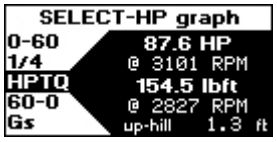
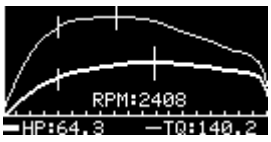


Figure 20: SS Run Review, 0-60 MPH time

Menu entry	Pressing **SELECT** button brings up:	Graph provides:	Graph is useful for:
		Graph of vehicle speed throughout the run	• Measuring time to get from one speed to another (e.g. 0-100 MPH, 50-70 MPH, 0-100-0 MPH, etc.)
		Real time replay with vehicle speed and milestones times	• Viewing intermediate milestones (e.g. 330 ft time)

PRELIMINARY

		Graph of Horsepower output throughout the run	• Estimating effects of wind drag on your vehicle • Looking at horsepower throughout the run
		Graph of vehicle speed vs. distance to stop, the braking distance graph	• Measuring braking distance • Estimating effects of different tires and settings
		Graph of G-force throughout the run	• See how strong your car was pulling (accelerating) throughout the run • See how well your car brakes • Detecting wheelspin
		Graph of Horsepower and Torque vs. RPM	• Getting a “dyno plot” for your vehicle • Determining the best shift-point

7.2.1 Speed graph

The Speed graph provides you with a graph of speed throughout the run.

You can use this graph to measure:

- time from one speed to another speed (e.g., 0-50 MPH, 40-60 MPH, etc.)
- time to accelerate from 0 to a certain speed, and brake to 0 again (e.g., 0-100-0 test)
- time to brake to halt from a particular speed (e.g., 60-0 braking time)

You will see a graph such as the one shown in Figure 21. Of course the shape of the curve, as well as the numbers and milestones, will be different for your vehicle.

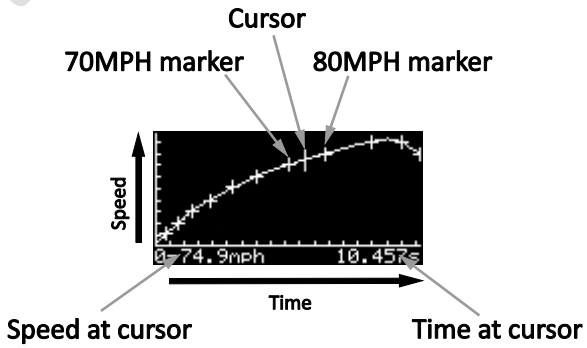


Figure 21: Speed graph

PRELIMINARY

Use **ROLLER** to move the cursor on the graph. As you move the cursor, the current speed and elapsed time indicators are updated to match the cursor position.

Each tick mark on the horizontal axis marks a 1-second difference. Each tick mark on the vertical axis marks a 10 MPH difference.

A plus sign (+) marks a 10 MPH change. Whenever you move the cursor past a plus sign, the numbers on the bottom of the graph are updated to reflect the time to get to that speed from 0 MPH.

Note: *The speed milestone indicator does not change until the cursor rolls over a different 10 MPH marker.*

Note: *See "***Error! Reference source not found.***" on page **Error! Bookmark not defined.** for detailed information on using this graph*

7.2.2 Real-time replay

Real-time replay provides you with a graph of speed throughout the run just as the speed graph, but instead 10 MPH marks on the plot, it has a milestones marks. In order to give you the feel and excitement of the run, the graph is replayed in real-time. This means that if you did a 15-second run, it will take 15 seconds to draw the replay.

Note: *To finish the replay quickly, rather than in real-time, simply press the* **SELECT** *button while graph is being drawn.*

Once the graph is fully drawn, you will see a graph such the one shown in Figure 22.

Note: *Your graph will look different due to your driving style and vehicle.*

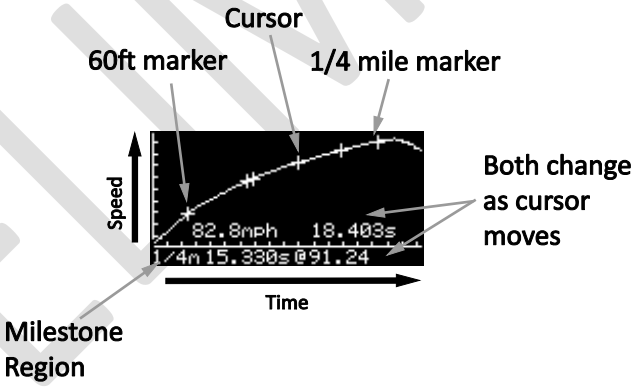


Figure 22: Real-time replay

Use **ROLLER** to move cursor along the plot. As cursor moves, the speed value and time stamp value adjust to reflect the values at the cursor position.

Each tick mark on the horizontal axis represents 1 second. Each tick mark on the vertical axis represents 10 MPH.

You will see a plus sign (+) on the graph at each place where a milestone occurred. When you move the cursor over a milestone marker, the milestone region will be updated with the name of the milestone and its timestamp.

PRELIMINARY

Note: *You must move the cursor over a milestone (from either direction) to update the milestone region. If you move the cursor near another milestone, but not over it, the milestone region will not be updated.*

7.2.3 Horsepower graph

The horsepower graph shows net and total horsepower throughout a run. Net horsepower is what is actually used to accelerate the vehicle. The total horsepower has air drag and other losses included, so it should approximate the real engine power at any time.

This is not the optimal graph for analyzing horsepower. It will show artifacts around shift points that are due to factors other than engine horsepower. It will also show the increasing effect of aerodynamic drag on the vehicle and the corresponding lower "net horsepower" as the speed increases.

The graph resembles the one shown in Figure 23. Of course the shape of the curve, as well as the numbers and ranges, will be different for your vehicle.

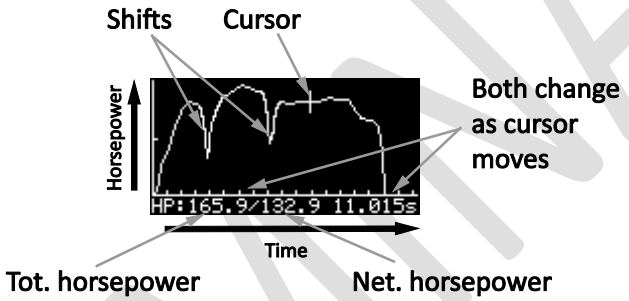


Figure 23: Horsepower graph

Use **ROLLER** to move cursor. As cursor moves, the horsepower and time values are adjusted to follow the cursor.

Note the "dips" in measured horsepower on the graph. As soon as you push in the clutch to shift, you decelerate (due to aerodynamic drag), and there is no net horsepower delivered to the wheels.

7.2.4 Braking distance graph

You can use the G-TECH to measure 60-0 MPH braking distance. To measure your vehicle's 60-0 braking distance:

- perform an acceleration run as usual (you do not need to perform a full ¼ mile, but make sure you reach at least 60 MPH)
- when you are done accelerating, brake hard all the way to a stop

Note: *If you do not brake to a complete stop at the end of your run, and wait for the E.T. clock to stop, you will not get a good 60-0 MPH braking distance measurement.*

The 60-0 result screen will be similar to one shown below in Figure 24 but the shape of the curve and displayed values will look different due to the different driving style and different vehicle.

PRELIMINARY

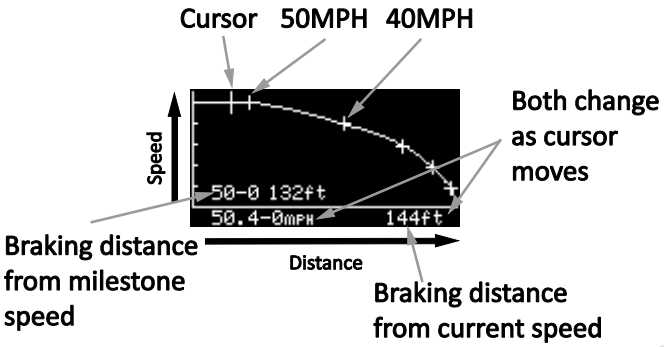


Figure 24: Braking distance graph

Use **ROLLER** to move the cursor along the plot. As the cursor moves, the current speed and distance to stop are updated to match the cursor position.

Each tic mark on vertical axis marks 10 MPH difference. A plus sign (+) marks a 10 MPH change. Whenever you move the cursor past a plus sign, the numbers on the bottom of the graph are updated to reflect the distance from that speed to a stop.

7.2.5 G-force graph

The G-force graph shows the measured G-force throughout a run. Larger G values indicate stronger acceleration.

The graph is useful for seeing how hard your vehicle was pulling when it was accelerating (positive Gs) and how hard it was decelerating while braking (negative Gs).

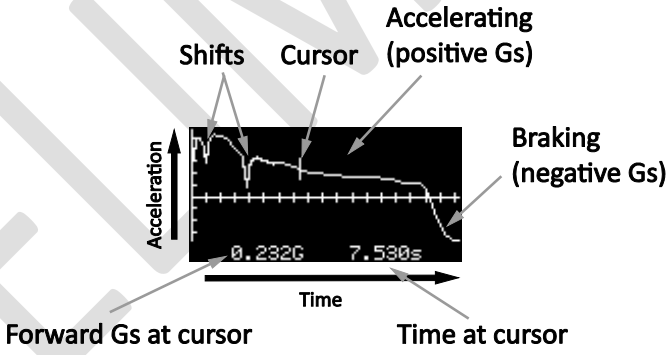


Figure 25:G-force graph

Use **ROLLER** to move the cursor. The G-force and timestamp always pertain to the current cursor position. Each tic mark on the horizontal axis marks 1 second. Each tic mark on the vertical axis marks 0.1 G of acceleration.

Positive G-force means the vehicle is accelerating. Negative G-force means the vehicle is decelerating (shifting, coasting, braking).

The brief dips in plot are shift points. When you shift, you temporarily remove power, and this causes the vehicle to decelerate briefly, until you re-engage the next gear.

PRELIMINARY

In a very powerful vehicle, or a traction-limited vehicle, you may also notice dips in acceleration that are not due to shifts. These dips are due to more power being applied to the wheels that can be handled. The net result is that the wheels spin and the vehicle does not accelerate much.

The large dip you see at the end of the graph is a hard braking at the end of the run. Notice that at the end of the graph, Gs can show zero value. This is because vehicle came to a stop. Hence there is no acceleration or deceleration.

7.2.6 Horsepower and Torque graph

One of the most exciting features of the G-TECH is its ability to measure and graph your vehicle's horsepower and torque against an RPM range.

The G-TECH's HP-TQ plot provides you with a graph of horsepower and torque throughout an RMP range in a single gear. This is the "dyno plot" that everyone is accustomed to seeing.

Note: *In order for you to get consistent HP & TQ graphs, there is a special driving technique. This technique is different than the driving technique you would use for a quick ¼ mile. Please refer to "HP-TQ Measurement" on page 16 for more information on optimal technique for performing horsepower runs.*

You will see a graph such the one shown in Figure 26. Of course the shape of the curve, as well as the numbers and ranges, will be different for your vehicle.

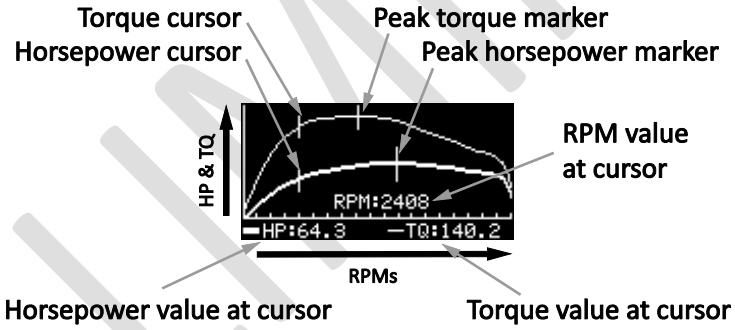


Figure 26: HP & TQ graph

You will notice a few things about Figure 26. The horsepower curve is drawn in a **thick line**, the torque curve is drawn with a thin line. Also the peak horsepower and torque values are marked on the graph.

Use ROLLER to move cursors for HP and TQ. As cursor moves, the RPM, HP and TQ values are updated to reflect the current cursor position.

PRELIMINARY

7.3 RR Session Review

The RR session review allows you to see all the details of particular session. These details include results like:

- best lap time
- lap to lap timing
- segment times
- forward acceleration and braking throughout a session
- lateral acceleration throughout a session
- session replay with map view

There are two ways to enter the RR Session Review:

- Automatically after you have finished recording a session
- When you open a saved session from SD file system (please see section 7.1.2 on page 29)

When you open the session for review, you will se a screen as show below:

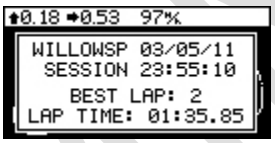


Figure 27: RR Session Review, splash screen

This screen shows you the name of the map with date and time of session. Also you can see what lap was the fastest and what was the actual time for that lap. You can close this message by pressing **REC** button and continue with RR replay. To bring this message back on the screen, press **REC** button any time during the replay.

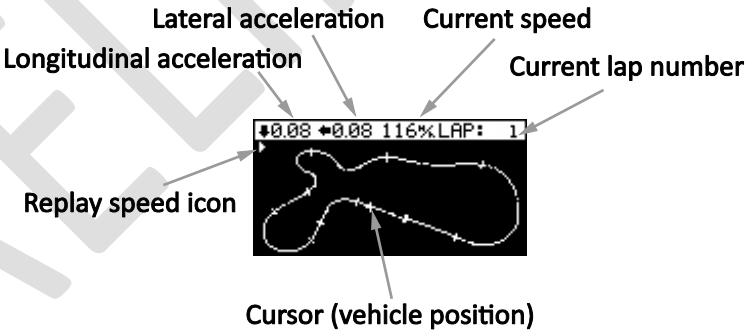


Figure 28: RR Session Review, replay started

After closing the initial screen, the RR replay starts and you will see a screen similar to the on in Figure 28. The top of the screen shows longitudinal and lateral accelerations, current speed and current lap number. The central part of the screen shows the map on which this session was driven. Your vehicle is represented with plus sign (+) cursor that moves along the track. Top left corner, just below the top line holds the replay speed icon.

PRELIMINARY

Initially the RR Session Review is in real-time replay, indicated by replay speed icon in the shape of standard play sign. You can change the replay speed to 2, 5 or 10 times the real-time replay. Also you can pause the replay, or make it go in reverse. Reverse replay also has 2, 5 and 10 times replay speed. Replay speeds faster than real-time are indicated by standard fast-forward icons. Paused replay has a standard pause sign for replay speed icon.

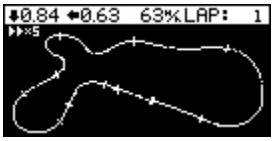


Figure 29: RR Session Replay, fast-forward x5

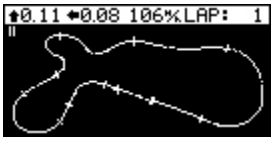


Figure 30: RR Session Replay, pause

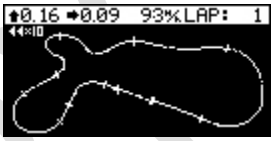


Figure 31: RR Session Replay, fast-reverse x10

Use **ROLLER** to change the replay speed. Turning **ROLLER** up will increase the replay speed, and turning it down will decrease the replay speed. Once you are in real-time replay speed, turning **ROLLER** down will set replay to pause. Turning ROLLER down again, will change replay-speed to reverse. Additional turns down will set replay speed to 2, 5 and 10 times real-time in reverse respectively.

One of the great things in RR replay is the LAP JUMP mode. It allows you to jump laps from any point on the map. This is very useful when comparing different laps. You can see what you did differently in each lap, what was your speed in one, and what in other.

To get into LAP JUMP mode just push **SELECT** button once. The replay will stop and replay speed icon will change to LAP JMP indicating LAP JUMP mode. Now you can jump into another lap at the same track position by turning the **ROLLER** button. This way you can quickly compare segments from different laps or see how many Gs you pulled at a particular corner in different laps. To get out of the LAP JUMP mode simply press **SELECT** button again. This way you don't have to replay all the laps to find the one you are looking for.

While in LAP JUMP mode, each time you jump, the lap time message will appear. This message shows you what is the current lap, time you had in that lap and whether that is the best lap in session. See images below for details.

Figure 32: RR Session Replay, lap jump

Figure 33: RR Session Replay, lap jump, best lap

PRELIMINARY

During a replay, every time the cursor goes over two successive gates you will get the segment time defined by those gates. Similarly, each time the cursor crosses the start gate, you will see a message with lap number and lap time. See images below for details. Segment and lap times are displayed only when crossing the gates in forward direction.

Figure 34: RR Session Replay, segment time

Figure 35: RR Session Replay, lap time

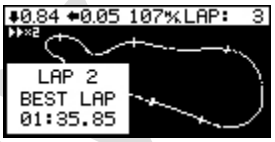


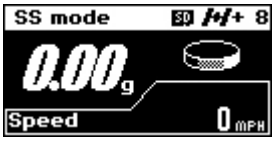
Figure 36: RR Session Replay, best lap time

To exit RR Session Replay, press **MENU** button at any time.

7.4 Deleting a Run

7.4.1 Deleting from internal memory

To delete a run

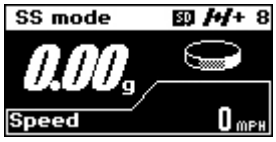
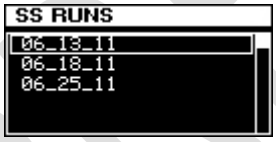
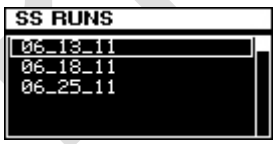
		Press **MENU** button to enter ***Main Menu***		
		Use **ROLLER** to select ***Saved runs*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select the run you want to delete		Press **SELECT** button to confirm
		Use **ROLLER** to select ***Erase this run*** option		Press **SELECT** button to confirm

PRELIMINARY

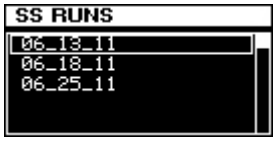
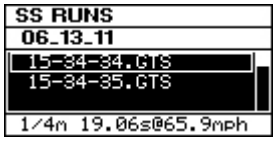
		Use **ROLLER** to select ***YES*** or ***NO***		Press **SELECT** button to confirm

7.4.2 Deleting from SD Card File System

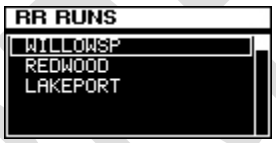
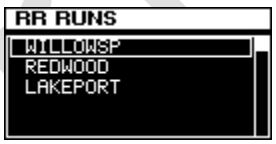
SD Card File System is available on RR units and it's organized as folders and files. Both SS Runs and RR Sessions are saved here. To delete a SS run,

		Press **MENU** button to enter ***Main Menu***		
		Use **ROLLER** to select ***Saved runs*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select type of run you want to delete		
		Use **ROLLER** to select type of run you want to delete		Press **SELECT** button to confirm
		Assuming you selected to delete a SS Run you will see a screen with date folders as shown here. SS Runs are organized in those folders according to the date they were recorded. You have an option to delete the whole date folder with all the runs in it, or to delete a single run.		
		To delete a folder, use **ROLLER** to select which one you want to delete		Double-click **SELECT** button to confirm

PRELIMINARY

		Use **ROLLER** to select ***YES*** or ***NO***		Press **SELECT** button to confirm
		To delete a specific run, select date folder using **ROLLER**		Press **SELECT** button to confirm
		Use **ROLLER** to select a run you wan to delete		Double-click **SELECT** button to confirm
		Use **ROLLER** to select ***YES*** or ***NO***		Press **SELECT** button to confirm

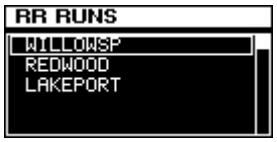
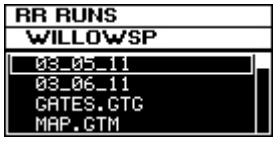
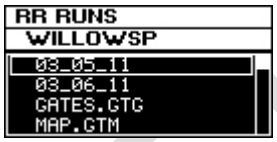
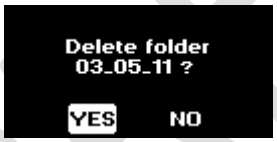
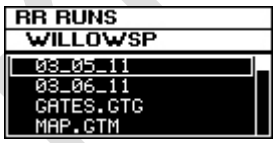
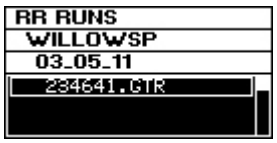
To delete an RR session

		Use **ROLLER** to select type of run you want to delete		Press **SELECT** button to confirm
		If you selected to delete a RR run you will see a screen with map folders as show here. RR session are organized in map folders, based on map they represent. Within map folders are date folders with actual session recordings, a and two additional files, MAP.GTM and GATES.GTS file.		
		To delete or rename map folder, use **ROLLER** to select one of them		Double-click **SELECT** button to confirm

PRELIMINARY

		Use **ROLLER** to select ***Erase this map*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***YES*** or ***NO***		Press **SELECT** button to confirm

Note: *Erasing the map folder will also delete all date folders within together with MAP.GTM and GATES.GTS files. Effectively this will remove this map and all associated sessions from SD card.*

		To delete a specific run, select map folder using **ROLLER**		Press **SELECT** button to confirm
		When you open a map folder you will see a screen similar to one here. This particular map folder contains two date folders and two additional files, MAP.GTM and GATES.GTG.		
		To delete a date folder, and all sessions it contains, select one using **ROLLER**		Double-click **SELECT** button to confirm
		Use **ROLLER** to select ***YES*** or ***NO***		Press **SELECT** button to confirm
		To delete a single session file, use **ROLLER** to select date folder		Press **SELECT** button to confirm
		Use **ROLLER** to select session file		Double-click **SELECT** button to confirm

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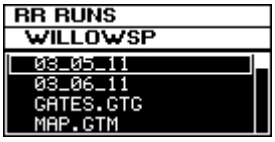
		Use **ROLLER** to select ***YES*** or ***NO***		Press **SELECT** button to confirm

7.5 Gates editing

To edit gates, go to saved RR sessions and open the map folder.

		Use **ROLLER** to select GATES.GTG file		Press **SELECT** button confirm
		Use **ROLLER** to move cursor along the track		Press **SELECT** button to set new gate in position of the cursor. Repeat these steps to place additional gates on the track.
		Repeat the step above to place additional gates on the track.		
		To delete a gate, use **ROLLER** to move the cursor backward.		
		As soon as cursor crosses the existing gate, G-TECH will ask you to delete that gate as shown below		
		Once you have set all the segments the way you want, press **REC** button to save that configuration.		

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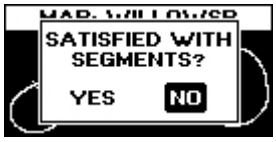
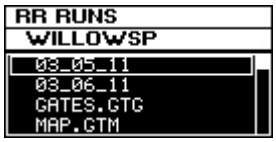
		G-TECH will ask you to confirm as shown here.
		If you selected NO in previous dialog, you will be given the option to start all over again as shown here. Selecting YES will restart gates editing and all the gates entered so far will be deleted.

7.6 Map rotation

To rotate a map, go to saved RR sessions and open the map folder.

		Use **ROLLER** to select MAP.GTM file		Press **SELECT** button to confirm
		Use **ROLLER** to rotate the map to preferred position		Press **SELECT** button to confirm new setting
		Use **ROLLER** to rotate the map to preferred position		Press **MENU** button to cancel map rotation

Note: *This new orientation will apply to RR session review, map selection screen and all other screens that need to display a map*

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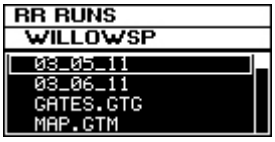
7.7 Renaming the map

To rename a map, go to saved RR sessions and open the map folder.

		Use **ROLLER** to select MAP.GTM file		Double-click **SELECT** button to bring up next menu
		Use **ROLLER** to select ***Rename this map*** option		Press **SELECT** button to confirm
		On top of the screen is the current name of the map which you wan to change. In the central part of screen you can see a row of eight letters and numbers, with a highlight on selected character.		
		Use **ROLLER** to change selected character		When satisfied with your selection, press **SELECT** button to move highlight to next character. Use this to set all the letters for map name.
		Press **REC** button to confirm renaming the map Press **MENU** button to cancel map rename		
		If map folder with entered name already exists, G-TECH will display a message as shown here.		
		In that case press MENU button to remove this message from screen and enter a different name for the map.		

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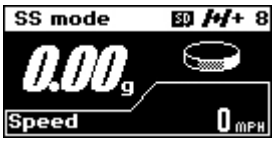
8 Additional Features

8.1 Configuring Main Screen

During everyday driving, Main Screen can show three real time measurements, G-force, speed and horsepower. Each of these measurements can be shown as primary or secondary displayed value. To configure the Main Screen displayed:

		Press **MENU** button to enter ***Main Menu***		
		Use **ROLLER** to select ***Setup*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***G-Tech setup*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***Main screen*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select which measurements you want on Main Screen. Bottom of the screen shows your current selection. In this example, G-force for primary and speed for secondary displayed measurement. There is also a “Rotation with roller” option which enables changing the displayed measurements from Main Screen by using **ROLLER** at any time.		
			Press **SELECT** button to confirm	
			Press **MENU** button to cancel	

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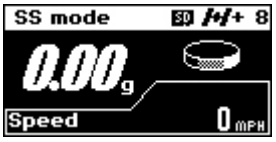
8.2 Changing Map-Vicinity Automatic Recording setting

To change Map-Vicinity Automatic Recording setting

		Press **MENU** button to enter ***Main Menu***			
		Use **ROLLER** to select ***Setup*** option		Press **SELECT** button to confirm	
		Use **ROLLER** to select ***G-Tech setup*** option		Press **SELECT** button to confirm	
		Use **ROLLER** to select ***RR setup options***		Press **SELECT** button to confirm	
		Use **ROLLER** to select ***Automatic recording***		Press **SELECT** button to confirm	
		Use **ROLLER** to select ***YES*** or ***NO***			Press **SELECT** to confirm
					Press **MENU** to cancel

8.3 Upgrading SS to RR

To upgrade your G-TECH from SS to RR you will need an RR Upgrade Kit. This kit will automatically convert your G-TECH into the RR model. Installation is very simple, just open the back of the unit and insert the memory expansion card (no tools required). Kit includes memory expansion card, micro SD card and micro SD card USB reader (no PC drivers needed).

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8.4 Moving Runs To SD Card File System

When using the G-TECH without microSD card (SS unit, or RR unit with no microSD card inserted) you can record only the SS runs. Those runs are saved to internal memory.

If you have some runs in internal memory and you power-up the G-TECH with microSD card inserted, G-TECH will offer to move the runs as shown below:

		Use **ROLLER** to select ***YES***		Press **SELECT** button to confirm
		G-TECH will start copying the runs		
		When copying is done, G-TECH will inform you with this message		

8.5 HP Losses

When doing a horsepower calculation, the G-TECH can directly measure only the time and acceleration of your vehicle. To calculate horse power, you need to tell G-TECH the exact weight of your vehicle. With those data it is possible to calculate the net horsepower. That's the power actually used to move your vehicle, sometimes referred to as wheel horsepower (whp) or effective horsepower.

Note: *Always perform horsepower and torque measurements on flat road. As indicated above, the G-TECH calculates horsepower by measuring vehicle's acceleration. Driving on a sloped road can increase or reduce acceleration when driving downward or upward. If you can't use the perfectly flat road, make two measurements in both direction, than average the results. This way slope errors will cancel each other.*

The net horsepower is lower than actual power produced by your engine. That's because some of the power produced by engine is lost on aerodynamic drag and various losses in the drive train. Where does that lost power goes? The aerodynamic losses shed some power on moving the air around vehicle, and overcoming the drag. The drive train losses include the rolling resistance of tires, friction losses in differentials, friction loses in the gear box, etc. At the end, all of the losses are converted into heat and sound/pressure waves.

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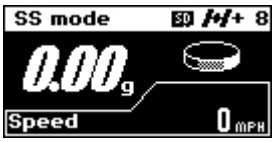
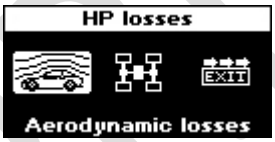
G-TECH can include all those losses in horsepower calculation, and give you the total horsepower for your engine, sometimes referred to as indicated or gross horsepower (theoretical capability of the engine). To do that, G-TECH needs to know you vehicle's frontal area, coefficient of drag and percents of power lost in drive train.

Even if you don't know the exact values of these parameters for you car, you can still get valuable results. For example, your total horsepower might not be exactly the same as factory number, but you can still see the difference before and after the modifications you made on your vehicle. Also, you can always use the net horsepower as your benchmark, since this is the actual power used to move your vehicle.

To change HP Losses settings,

		Press **MENU** button to enter ***Main Menu***		
		Use **ROLLER** to select ***Setup*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***Car setup*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***HP losses*** option		Press **SELECT** button to confirm
		You will have two options, to set aerodynamic losses		
		Or to set drive train losses		

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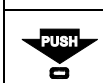
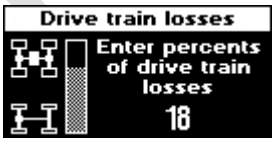
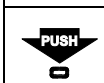
8.5.1 Aerodynamic losses

To enter this setup,

		Use **ROLLER** to select ***Aerodynamic losses*** option		Press **SELECT** button to confirm	
		Use **ROLLER** to select ***Frontal area*** option		Press **SELECT** button to confirm	
		Use **ROLLER** to adjust your vehicle frontal area			Press **SELECT** button to confirm
					Press **MENU** button to cancel
		Use **ROLLER** to select ***Coefficient of drag*** option		Press **SELECT** button to confirm	
		Use **ROLLER** to adjust coefficient of drag			Press **SELECT** button to confirm
					Press **MENU** button to cancel

8.5.2 Drive train losses

From ***HP losses*** menu,

		Use **ROLLER** to select ***Drive train losses*** option		Press **SELECT** button to confirm	
		Use **ROLLER** to adjust percents of drive train losses			Press **SELECT** button to confirm
					Press **MENU** button to cancel

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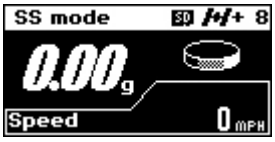
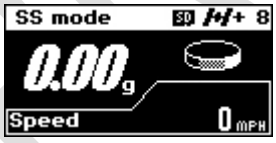
8.6 Enabling/Disabling Key Click

To change Key Click setting

		Press **MENU** button to enter ***Main Menu***			
		Use **ROLLER** to select ***Setup*** option		Press **SELECT** button to confirm	
		Use **ROLLER** to select ***G-Tech setup*** option		Press **SELECT** button to confirm	
		Use **ROLLER** to select ***Sound*** option		Press **SELECT** button to confirm	
		Use **ROLLER** to select ***YES*** or ***NO***			Press **SELECT** to confirm
					Press **MENU** to cancel

8.7 LCD settings

These settings are used to customize your G-TECH display the way you like. You can find them under the ***Display*** menu.

		Press **MENU** button to enter ***Main Menu***			
		Use **ROLLER** to select ***Setup*** option		Press **SELECT** button to confirm	

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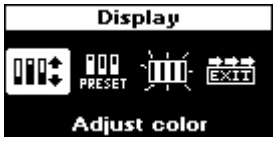
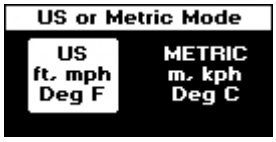
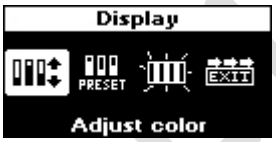
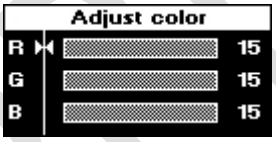
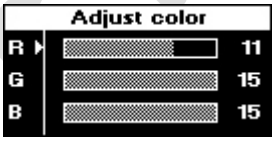
		Use **ROLLER** to select ***G-Tech setup*** option		Press **SELECT** button to confirm	
		Use **ROLLER** to select ***Display setup*** option		Press **SELECT** button to confirm	
		This is the ***Display*** menu for customizing your G-TECH display			
		Use **ROLLER** to select ***US*** or ***METRIC*** option		Press **SELECT** to confirm Press **MENU** to cancel	

8.7.1 Adjust color

This menu gives you an option to play with each individual segment of the color RED, GREEN and BLUE. Starting from ***Display*** menu

		Use **ROLLER** to select ***Adjust color*** option		Press **SELECT** button to confirm		
		It's set-up as an equalizer so that you can quickly get the color you like. As you enter the equalizer screen you are automatically adjusting RED color first, indicated by an upright arrow as shown here				
		Press **SELECT** button to select RED value		Use **ROLLER** to change RED intensity		Press **SELECT** to confirm

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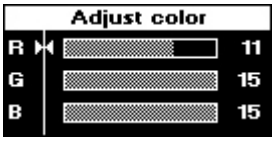
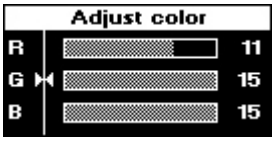
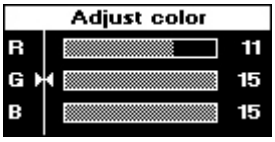
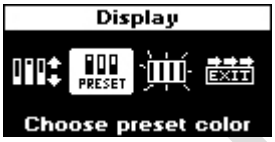
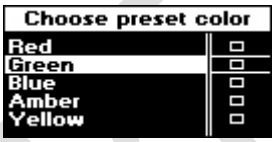
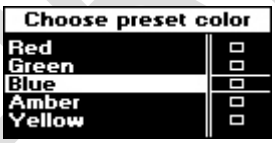
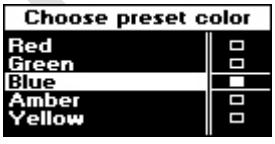
		Use **ROLLER** to select other color
		Repeat the process as described for RED color
		Press **MENU** button to leave this menu and confirm your settings

8.7.2 Preset colors

This menu allows you to choose from a few predetermined colors like pure, red, green, blue, amber and yellow. Starting from ***Display*** menu

		Use **ROLLER** to select ***Choose preset color*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select preset color		
		Press **SELECT** button to confirm selection. Display will change color immediately to reflect your selection.		
		Press **MENU** button to exit this screen.		

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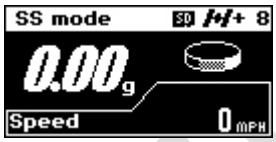
8.7.3 Adjust contrast

This option sets the contrast of the LCD. In some extreme temperature instances the LCD might need contrast readjustment. Starting from ***Display*** menu

		Use **ROLLER** to select ***Adjust contrast*** option		Press **SELECT** button to confirm
		Use **ROLLER** to set contrast for LCD. Contrast will change immediately to reflect your selection.		Press **SELECT** button to confirm

8.8 US or metric mode

This menu allows you to choose between displaying data in a US (Imperial) or Metric mode. All the logs that were recorded in US mode are automatically converted to the Metric mode and vice versa.

		Press **MENU** button to enter ***Main Menu***		
		Use **ROLLER** to select ***Setup*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***G-Tech setup*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***US or metric mode*** option		Press **SELECT** button to confirm

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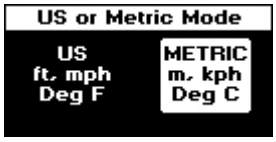
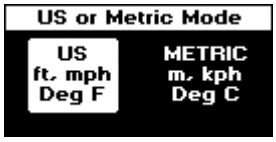
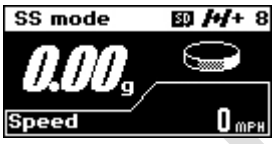
		Use **ROLLER** to select ***US*** or ***METRIC*** option			
		Use **ROLLER** to select ***US*** or ***METRIC*** option			Press **SELECT** to confirm
					Press **MENU** to cancel

8.9 Reset options

This menu will give you two options, to reset your G-TECH to factory defaults and to format SD card (for RR units). Resetting to factory defaults will delete all of your SS runs stored into internal FLASH. It will also reset all the custom settings that you have made and revert them to factory defaults. Formatting SD card will erase all data on it, all the SS runs and all the RR sessions.

Note: *Be careful when using this options, you may accidentally delete some files you didn't intended to.*

8.9.1 Format SD Card

		Press **MENU** button to enter ***Main Menu***		
		Use **ROLLER** to select ***Setup*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***G-Tech setup*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***Reset options***		Press **SELECT** button to confirm

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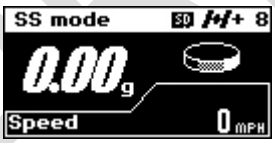
		Use **ROLLER** to select ***Format SD card*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***YES***		Press **SELECT** button to confirm
		While formatting, progress bar will fill up until formatting is done.		
		When formatting is completed, press **SELECT** button to confirm and return to ***Format SD card*** menu.		

Note: *Do not power-off your G-TECH while formatting is in progress. Doing so will cause SD file system errors. If formatting gets interrupted for whatever reason, repeat the process.*

8.9.2 Reset to factory defaults

In some cases you may want to restore the G-TECH to the condition it was when it was shipped from the factory. Restoring to factory defaults will clear out all the configuration information and runs stored in internal flash memory. For RR units, runs and session stored on micro SD card will not be affected.

Note: *Resetting the G-TECH to Factory Defaults resets nearly all the information stored in the G-TECH. Perform this step only if you are sure that you want to delete all configuration information and SS runs stored in internal memory.*

		Press **MENU** button to enter ***Main Menu***		
		Use **ROLLER** to select ***Setup*** option		Press **SELECT** button to confirm

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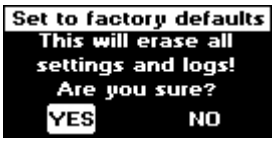
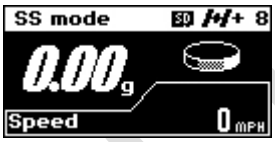
		Use **ROLLER** to select ***G-Tech setup*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***Reset options***		Press **SELECT** button to confirm
		Use **ROLLER** to select ***Set to factory defaults*** option		Press **SELECT** button to confirm
		Use **ROLLER** to select ***YES***		Press **SELECT** button to confirm
		While G-TECH is performing the reset to factory defaults you will see a message as shown here		
		Once the procedure is done, G-TECH will reset itself and you will see the Main Screen.		

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9 Additional Info

9.1 About GPS

Here you can find some facts and explanations regarding the GPS. Although complete understanding of these terms is not necessary in order to use G-TECH, these facts provide valuable information on this subject.

9.1.1 Update rate

G-TECH uses high speed GPS receiver with 10Hz update rate to increase accuracy and overall performance. This gives us capability to monitor car's speed and position more closely, ten times better than with average GPS receivers which usually have an update rate of once per second.

To illustrate importance of update rate, imagine your self driving a car down the track, but not being able to control your vehicle continuously. Instead, you are allowed do adjust speed and steering only once per second. Sure, you wouldn't have much control over your vehicle, unless you are driving really slow. Now try to visualize the same situation but being able to react ten times per second. This is a very different situation, it would actually allow you to drive quite well.

9.1.2 Sensitivity

The built-in GPS receiver in G-TECH is of latest generation which has an exceptional sensitivity. Coupled with ceramic patch antenna it gives G-TECH unrivaled performance in receiving GPS signal.

We have decided to utilize the fact that G-TECH is not a tiny hand-held, battery-powered device which has to keep it's size/weight and power consumption at bare minimum. Instead, we decided to choose GPS receiver by it's performance, rather by it's power consumption. Also the patch antenna we are using is far superior than chip antennas used in mobile phones and similar devices. This kind of antenna is unpractical for mobile phones because of it size and weight, so phone manufacturers are forced to go with miniature chip antennas with inferior performance.

9.1.3 SBAS System

Another key feature for improving GPS accuracy is built-in SBAS (Satellite Based Augmentation System) support. It improves GPS accuracy trough the integration of additional correction data from dedicated geostationary satellites.

There are several SBAS systems, but none of them has a global coverage. For example, WAAS covers north America, EGNOS covers Europe, MSAS is operational in Japan and parts of Asia while GAGAN is used in India. G-TECH addresses this problem by using GPS receiver capable of incorporating correction information from all of these systems, WAAS, EGNOS, MSAS and GAGAN.

9.2 About File System

G-TECH's micro SD card interface is capable of working with several SD card types, including the high capacity SDHC cards. Also, it can use cards formatted with both FAT16 and FAT32 file systems.

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But there are several things you should know about SD cards and file system. There are many devices capable of using and formatting SD cards, like personal computers, mobile phones, cameras, camcorders, etc. Formatting includes creating complex structures and setting several parameters which compose file system. Because of that, there are some differences between formatting on various devices. Some devices will format cards using FAT16 or FAT32 file system. They can also use different cluster sizes to suit their needs.

To ensure best performance, format your card using G-TECH. This will set appropriate file system and cluster size to optimize file system operations.

9.3 About Vehicle Weight

In order to calculate meaningful horsepower measurements, you must provide an accurate value for your vehicle's weight.

In this manual, the term "vehicle weight" refers to all the weight that is supported by the vehicle's tires (including the tires themselves). So this includes the driver's body weight, fuel weight, tools, fast food wrappers, etc.

If you are fortunate enough to have access to an accurate vehicle scale, go ahead and weight the vehicle as it would be equipped at the track (i.e., with you in it, the correct amount and type of fuel in the tank, etc.).

Some tracks even have scales available for weighting your vehicle. Also, some towns have dumps or refuse collection areas with large scales that you may be able to use. Moving companies may have vehicle scales as well.

If you can't weight your vehicle, estimate it. Use the manufacturer's data to obtain vehicle weight (from the Owner's Manual or the internet). Then adjust the weight based on the difference between your car as it was stock, and as it is now (Have you added heavier stereo? Have you removed the spare tire?). Don't forget to include your own body weight and the fuel as well.

You do **NOT** want to use the Gross Vehicle Weight Rating (**GVWR**) value that is provided in the vehicle door jamb as the actual vehicle weight.

GVWR is the fully-loaded vehicle weight with passengers. Thus, **GVWR** is always higher than actual vehicle weight, and if you enter **GVWR** instead of actual vehicle weight, your horsepower numbers will be artificially inflated.

A rough rule of thumb to estimate your vehicle weight from the **GVWR** exists, but don't rely on it being too accurate.

Again, this is very ROUGH rule of thumb… each manufacturer calculates **GVWR** in its own way…

The rule of thumb is to take the passenger capacity of the vehicle (e.g., 5 for a mid-sized sedan) and subtract from the **GVWR** 180lbs for each missing person.

Example: Suppose **GVWR** = 4200 lbs, vehicle capacity is 5 people, but we have only a driver. Thus there are 4 missing passengers, which means we subtract 4x180 lbs. The value 4200 lbs – 720 lbs = 3480 lbs. Thus you would enter 3480 lbs into the G-TECH for vehicle weight.

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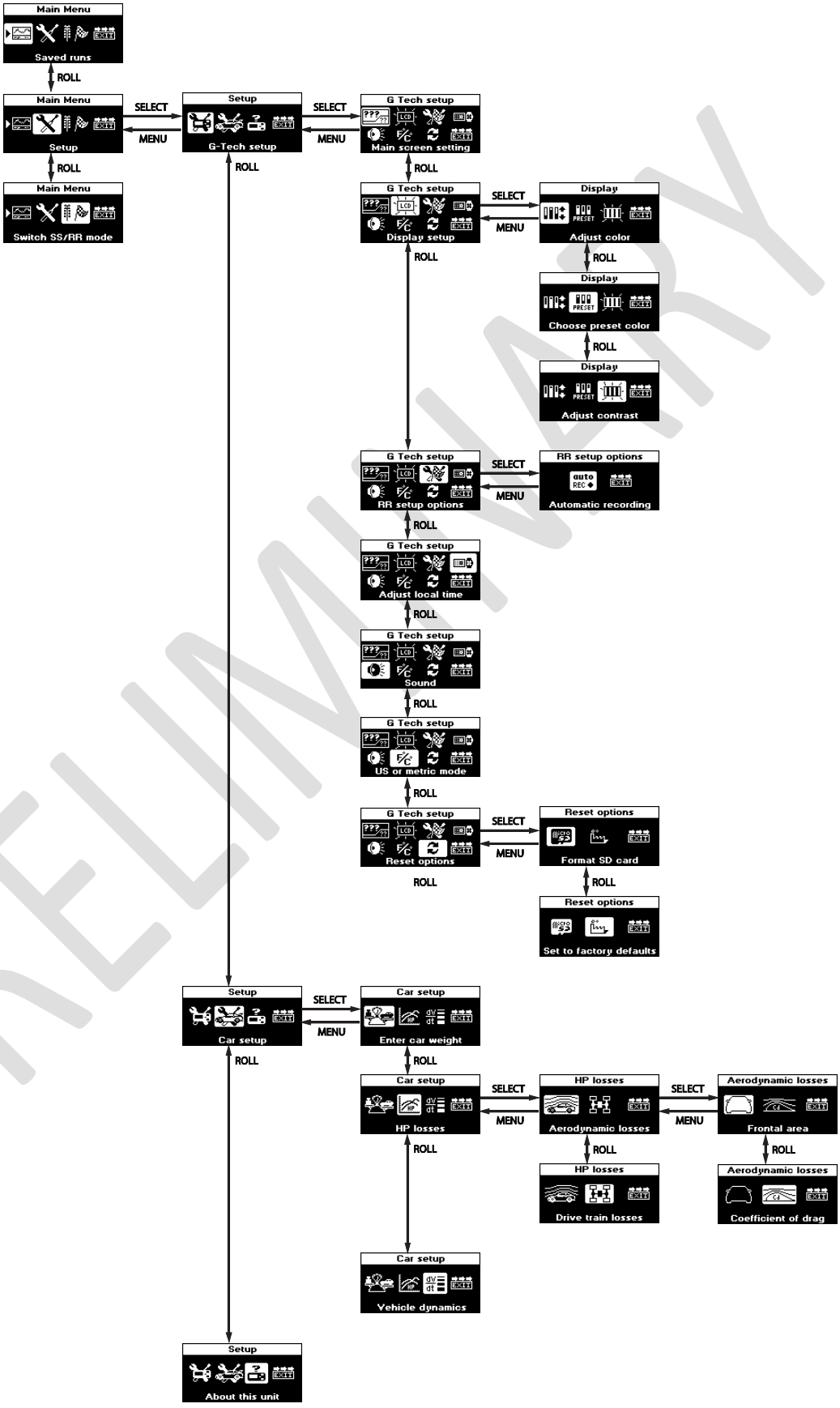
10 Appendix A – Menu map



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